Concepts for remote control of VLBI-telescopes and first experiences at Wettzell

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The Radiotelescope Wettzell (RTW), it's team and partner sites

RT Wettzell/Germany

The Wettzell VLBI crew (from left to right):
Ch. Plötz, E. Bauernfeind, G. Kronschnabl, R. Schatz, W. Schwarz, R. Zeitlhöfler, A. Neidhardt
(missing in picture: E. Bielmeier).

Table 2. RTW observations in 2008

program	number of 24h-sessions
IVS R1	49
IVS R4	51
IVS T2	6
IVS R&D	9
RDV/VLBA	6
EUROPE	5
CONT08	15
total	141
total (in hours)	3384

program	number of 1h-sessions
INT1(Kokee-RTW)	234
INT2/K(Tsukuba-RTW)	100
INT3/K(Tsukuba-RTW-NyAl)	41
total (in hours)	375

special program	number of experiments
SELENE	19
total (in hours)	92

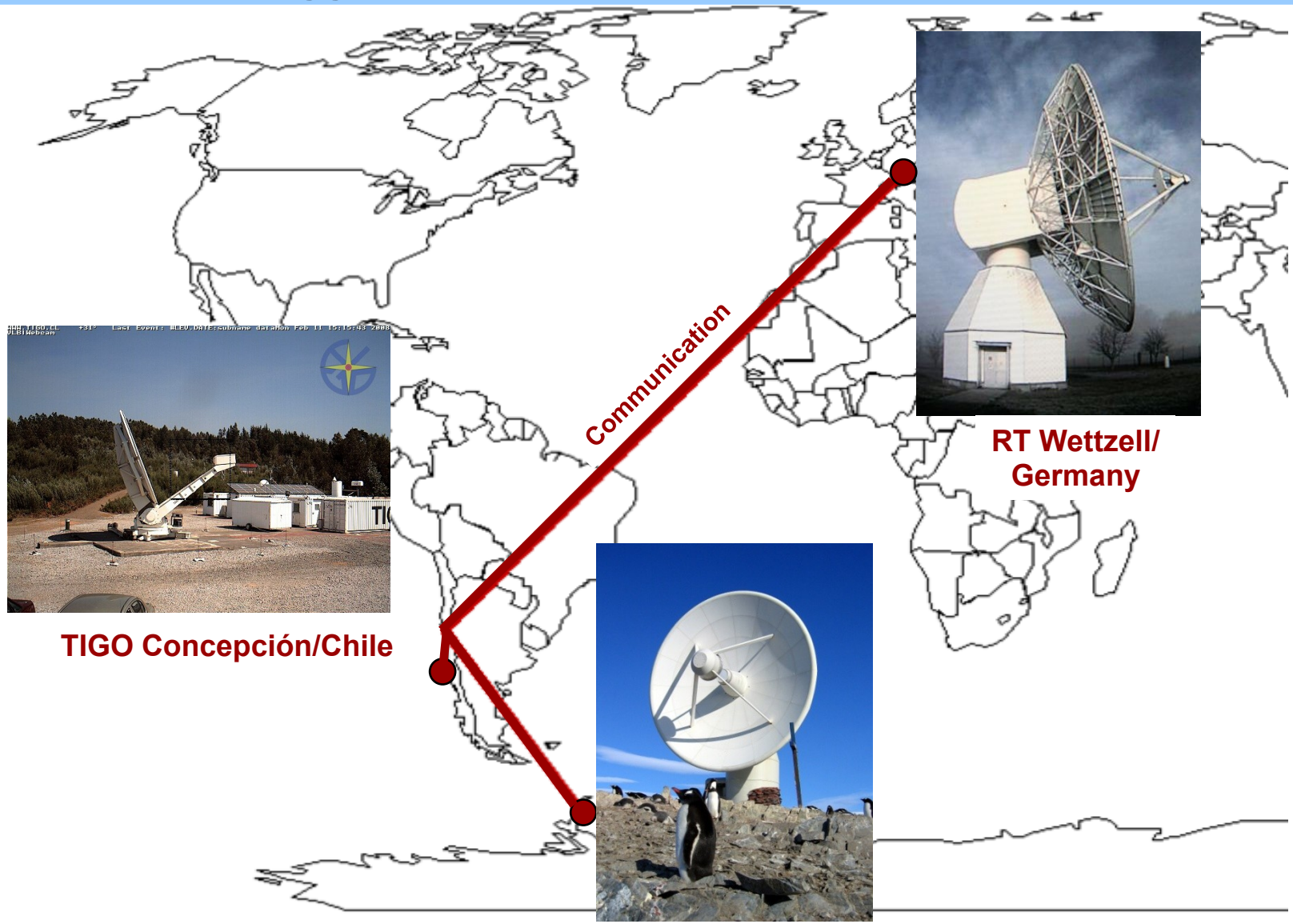
TIGO Concepción/Chile

GARS O'Higgins/Antarctica

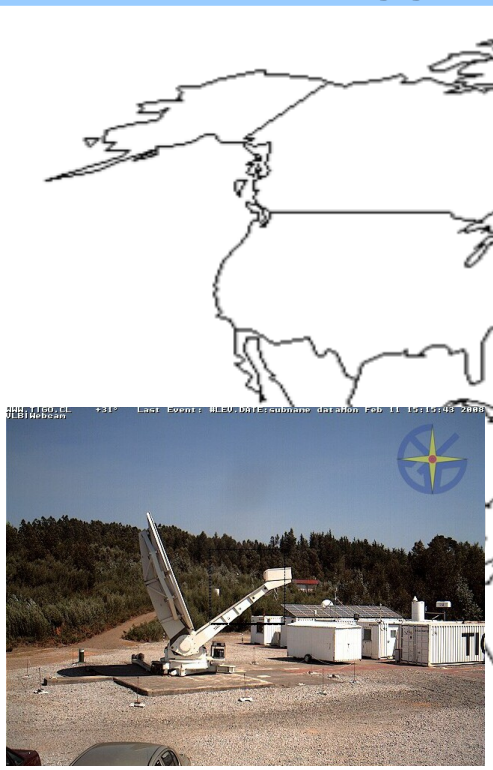
And in the future: TTW Wettzell

Wettzell and the idea of controlling VLBI telescopes by remote

The idea: remote attendance and control of VLBI telescopes Wettzell, O'Higgins/Antarctica and TIGO/Concepción



The idea: remote attendance and control of VLBI telescopes Wettzell, O'Higgins/Antarctica and TIGO/Concepción



TIGO Concepción/Chile

Communication

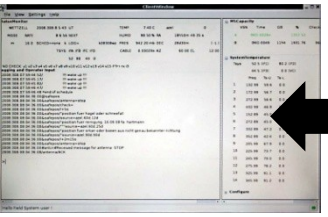
RT Wettzell/ Germany

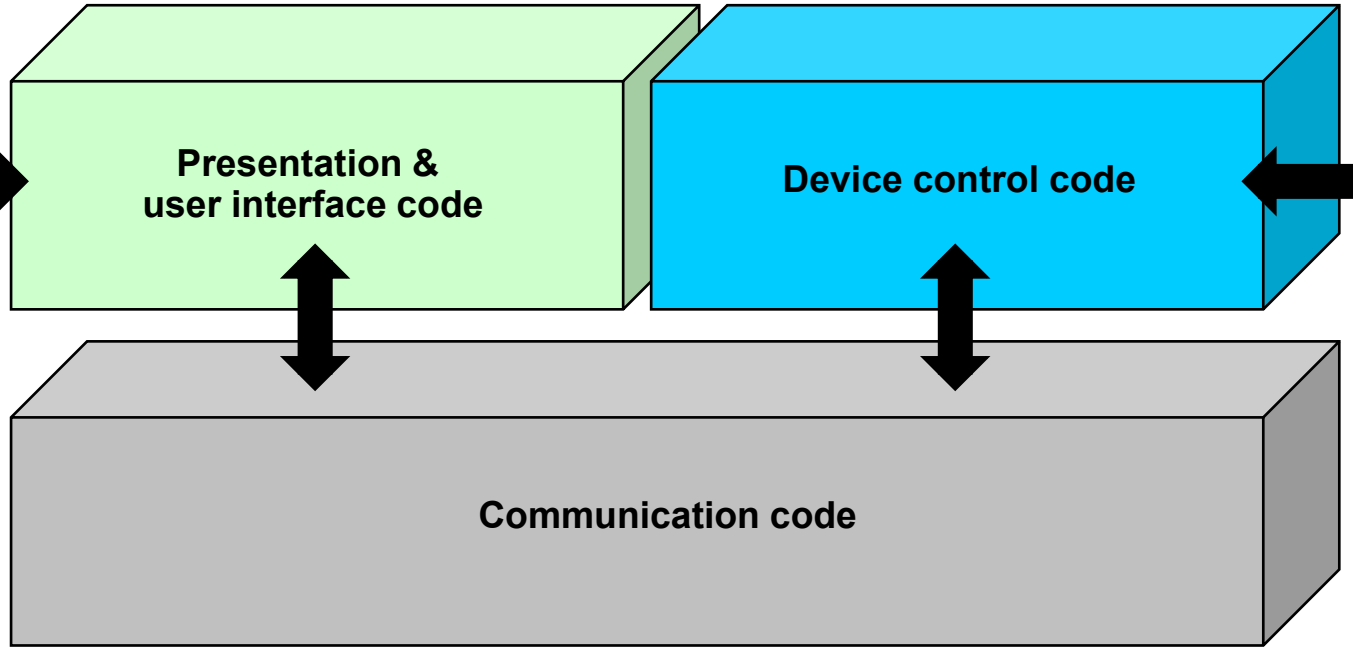
Remote Control on Site

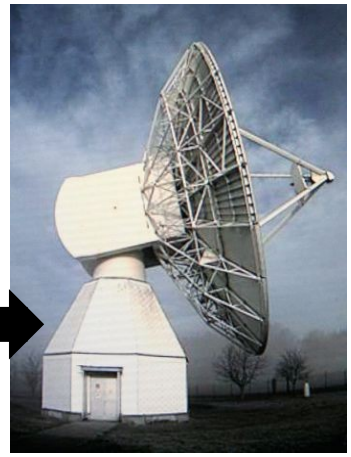
TTW Wettzell/ Germany

GARS O'Higgins/Antarctica

The idea: remote attendance and control of VLBI telescopes Wettzell, O'Higgins/Antarctica and TIGO/Concepción

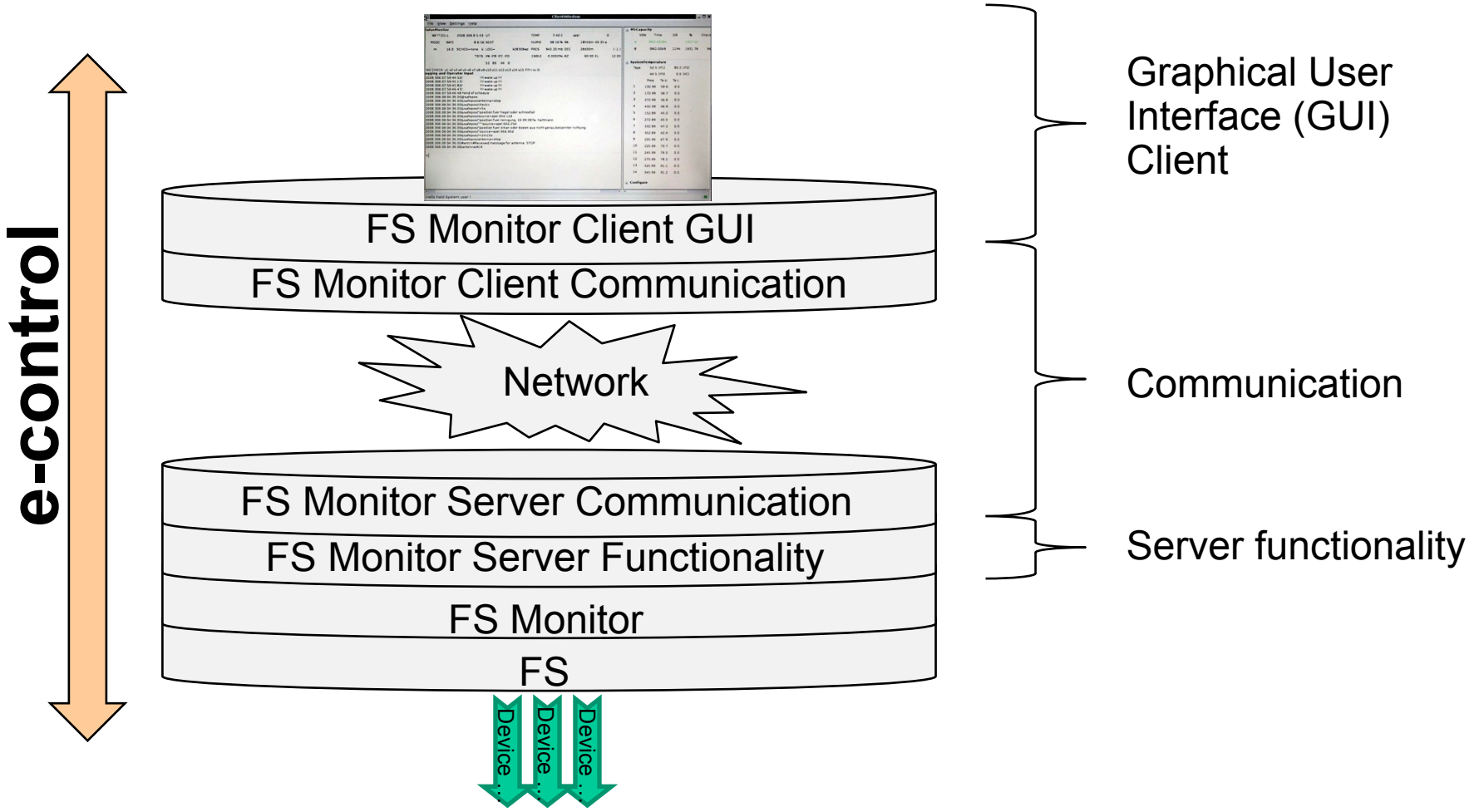




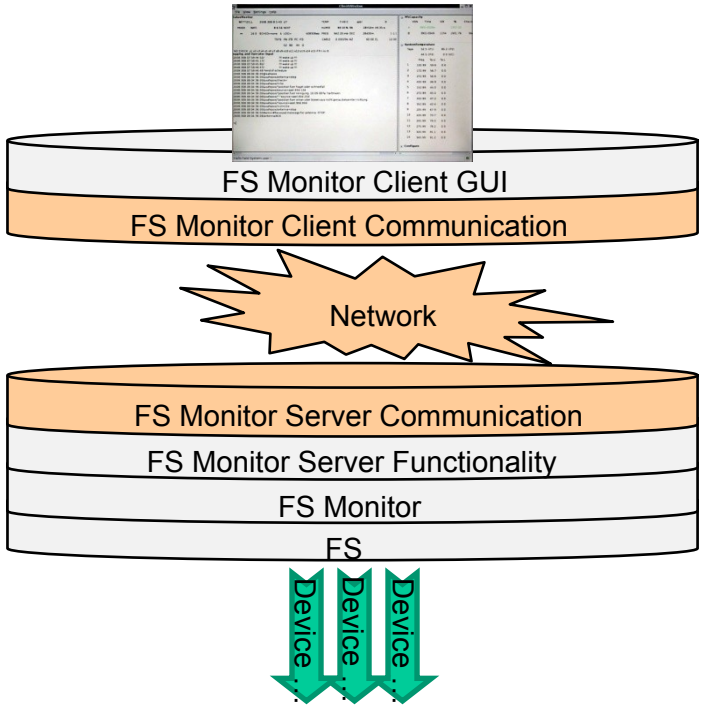


Idea of a strict design-separation of these parts

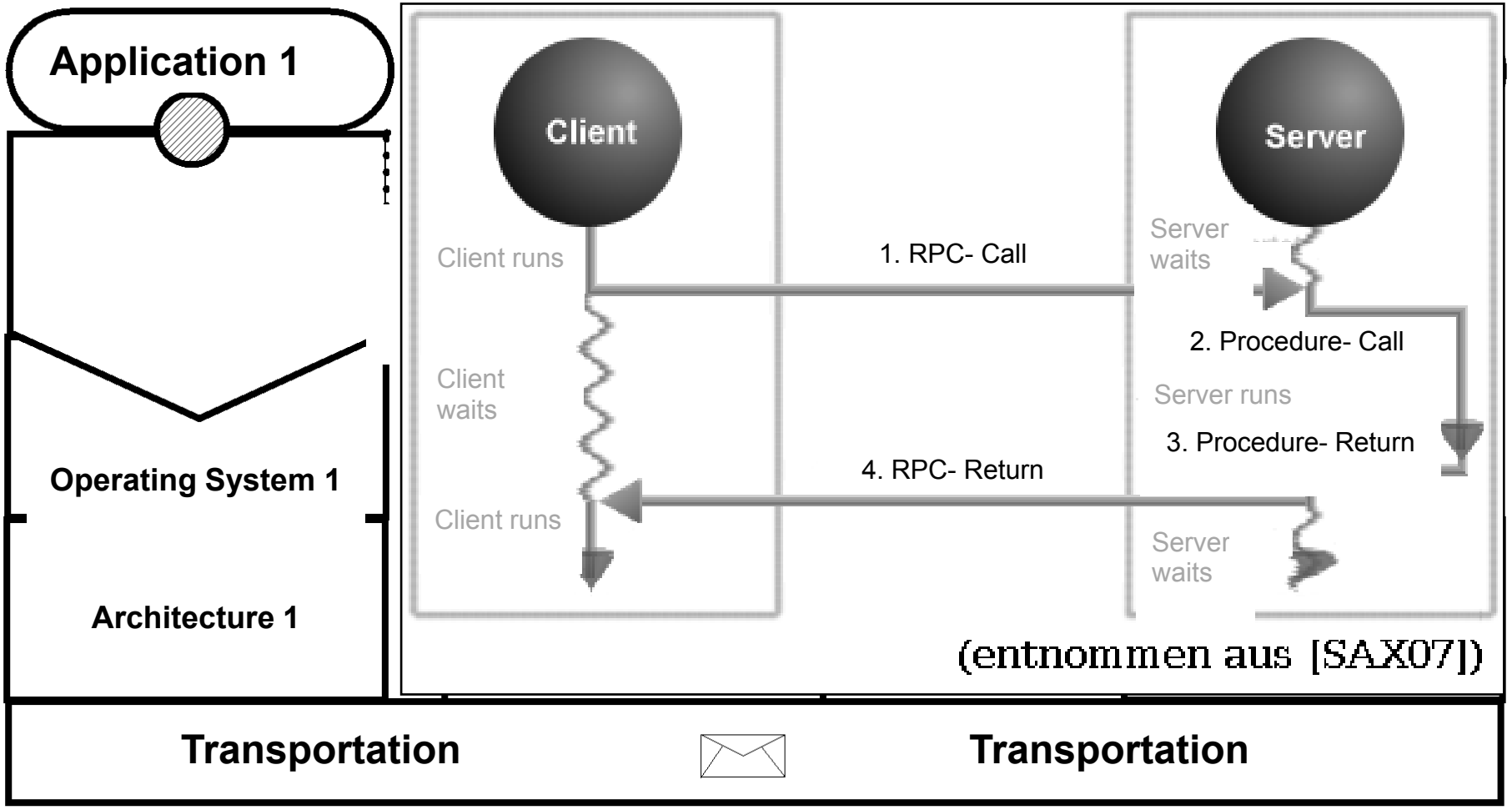
The idea: remote attendance and control of VLBI telescopes Wettzell, O'Higgins/Antarctica and TIGO/Concepción



The communication – with a remote procedure call middleware and ssh



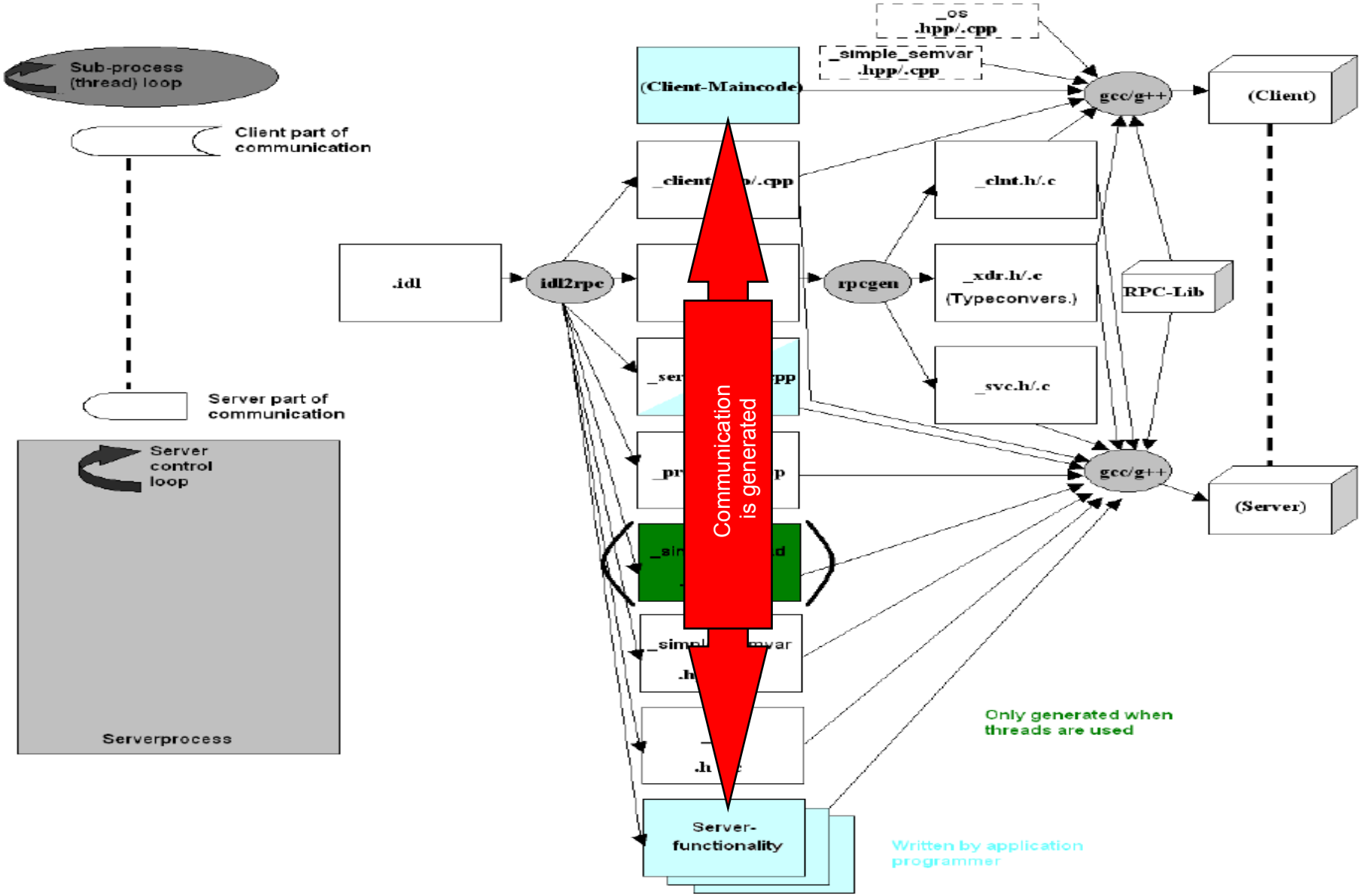
The communication – with a remote procedure call middleware



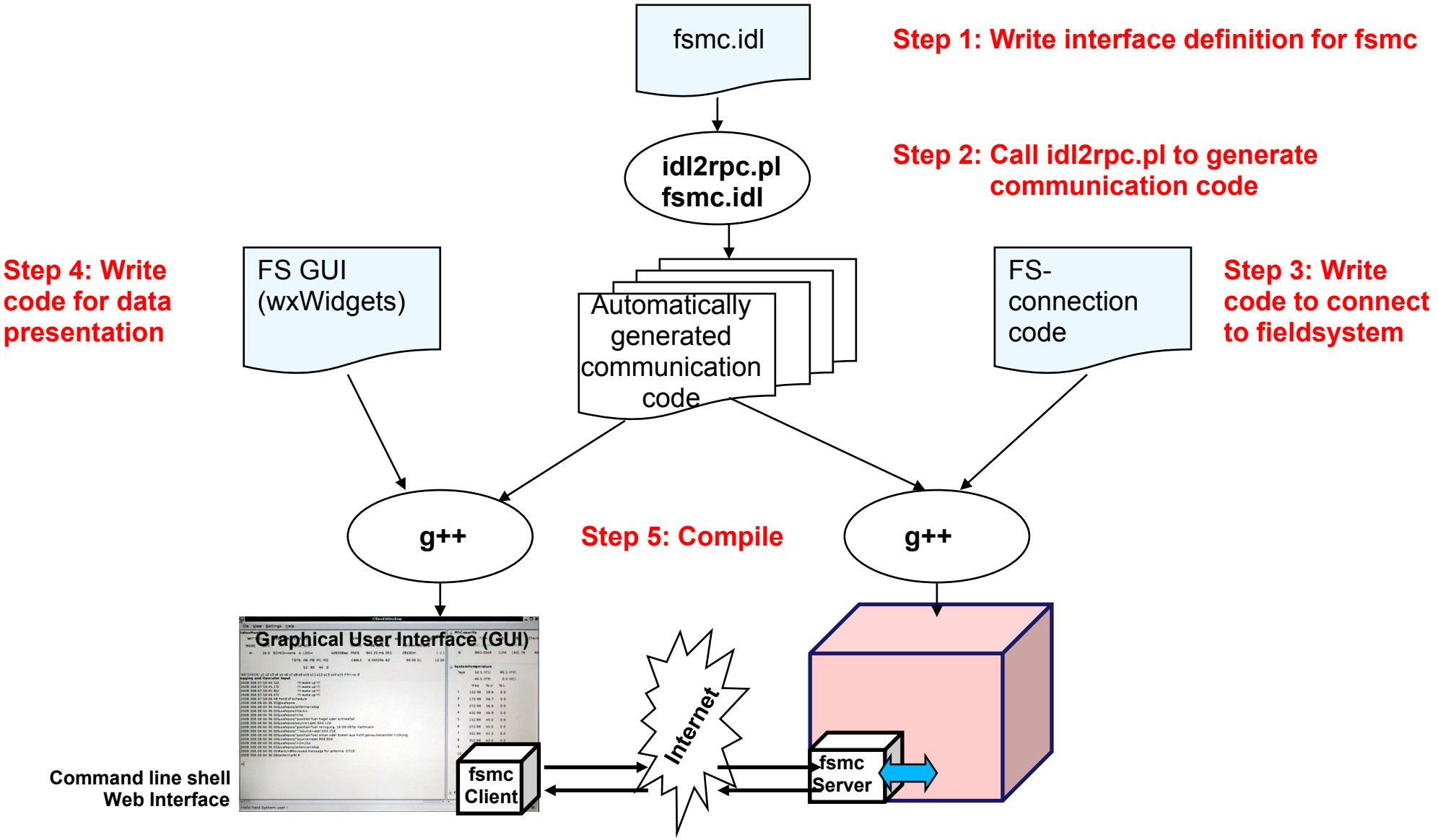
(nach [PUD01] a.a.O. S. 25)

[SAX07]: Saxonia Systems: Remote Procedure Call, http://www.linuxfibel.de/rpc.htm, Download 23.04.2007
[PUD01]: Puder, Arno; Römer, Kay: Middleware für vereteilte Systeme, 1.Auflage, dpunkt.verlag GmbH Heidelberg 2001

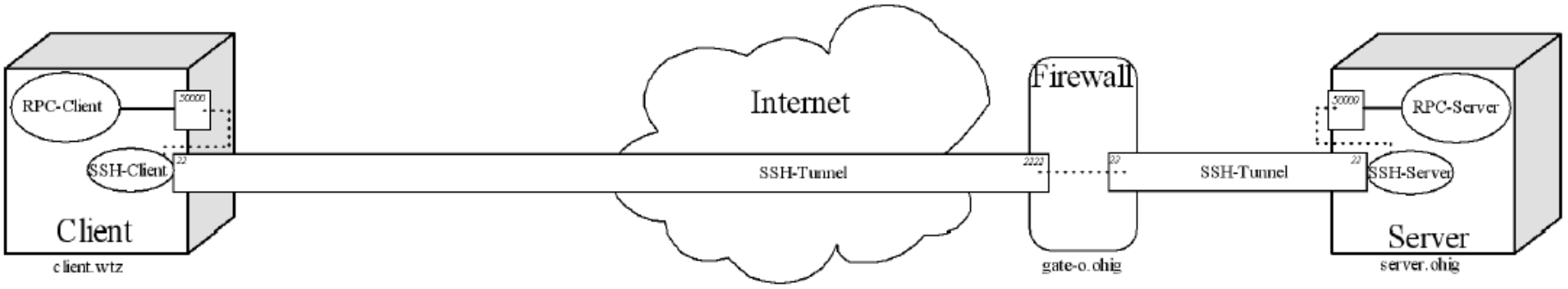
The communication – using a middleware generator



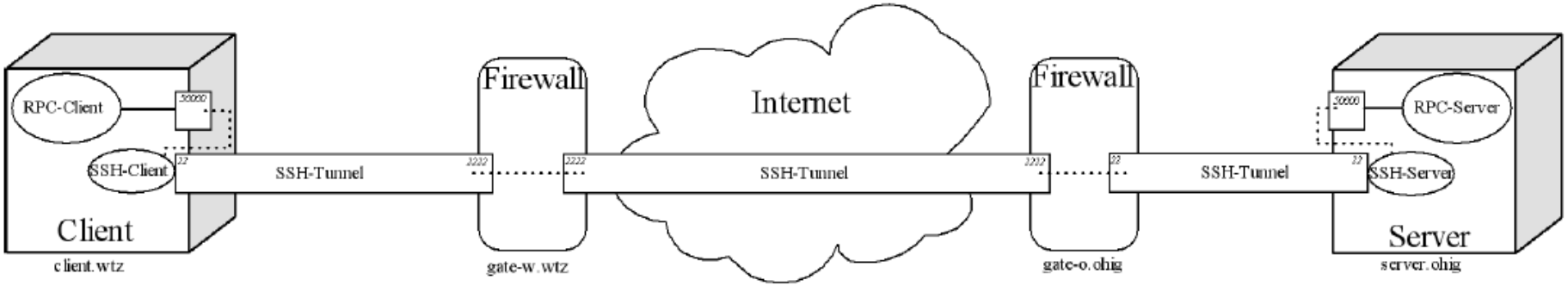
The communication – using a middleware generator



The communication – ssh - tunneling

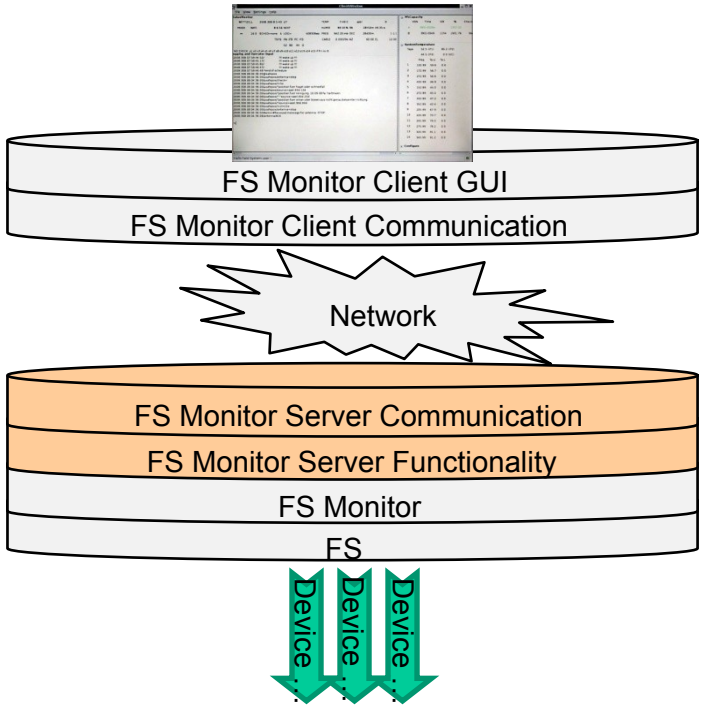



```
ssh -l <user>
    -p 2222
    -L 50000:127.0.0.1:50000
    gate-o.ohig
```



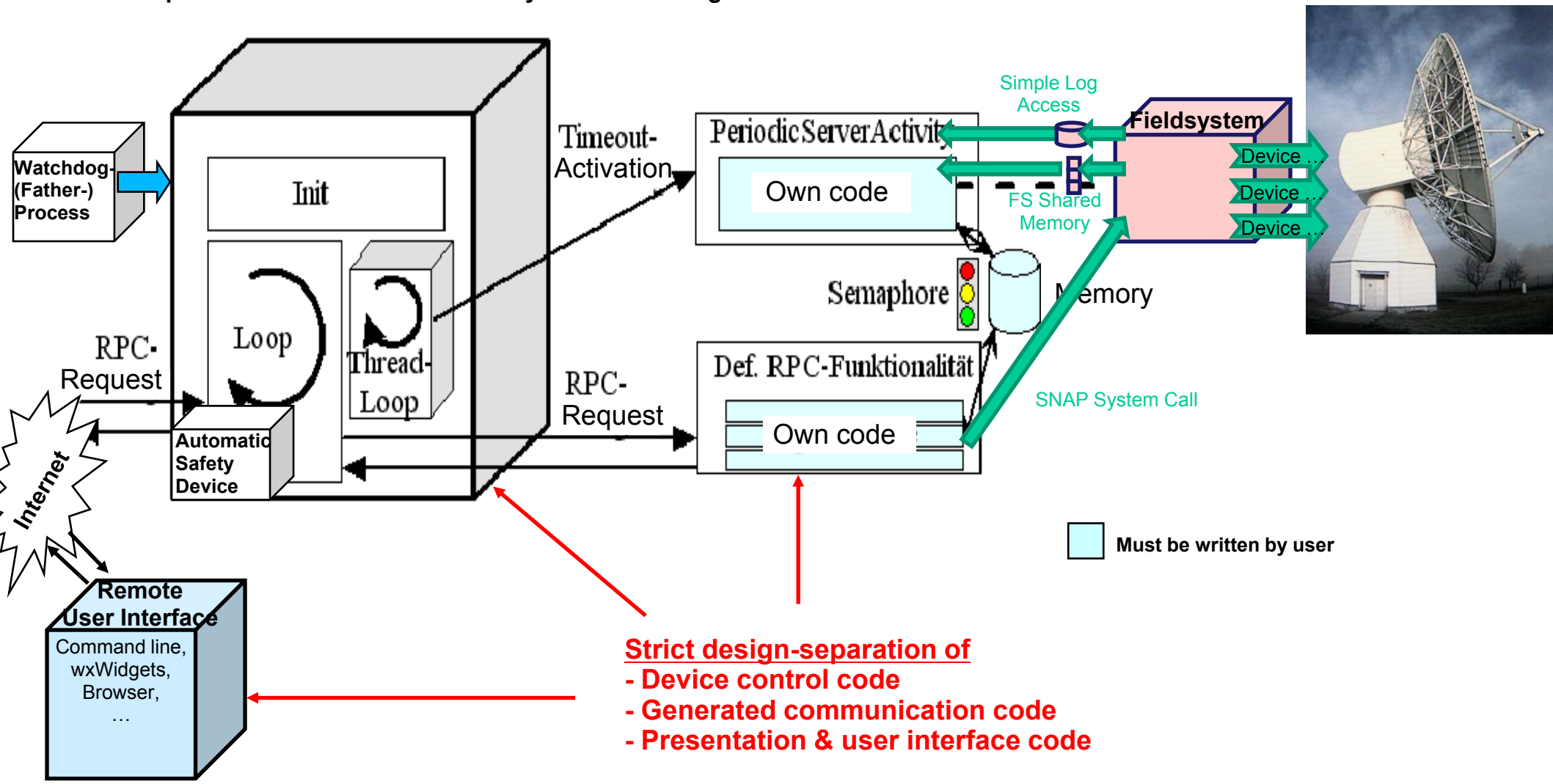

```
ssh -l <user>
    -p 2222
    -L 50000:127.0.0.1:50000
    gate-w.ohig
```

A fieldsystem extension – remote accessible, autonomous process cells

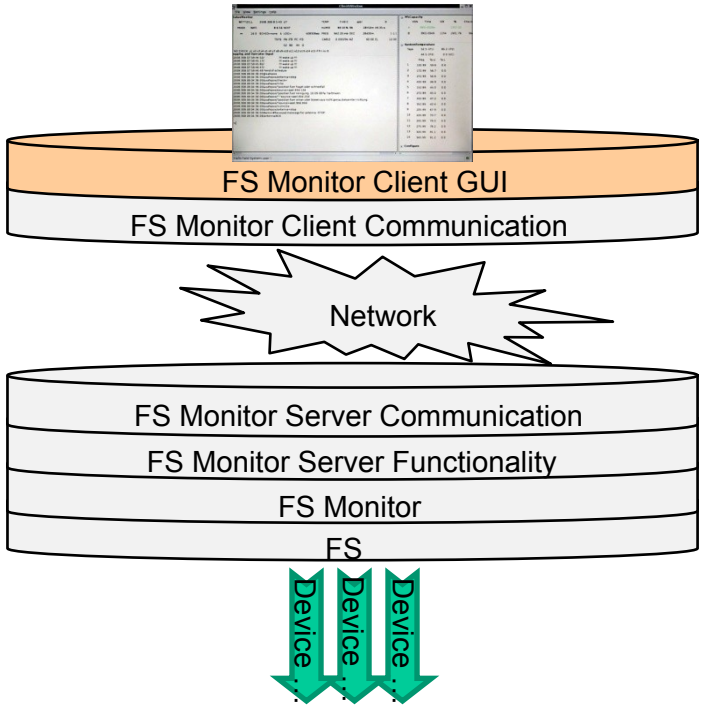


A fieldsystem extension – autonomous process cells

Autonomous process cell offers remote fieldsystem monitoring

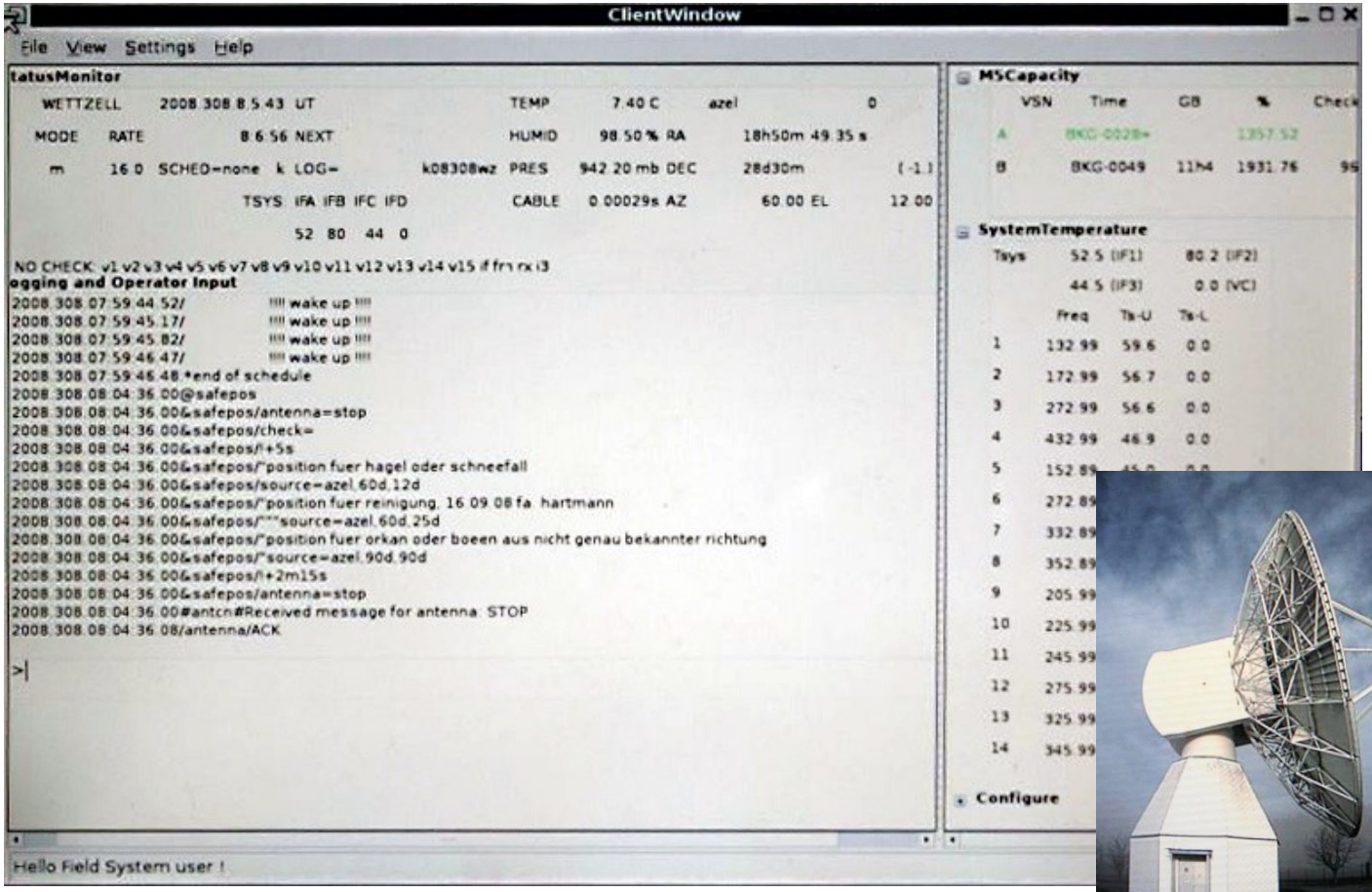


A fieldsystem client – remote (graphical) user interface



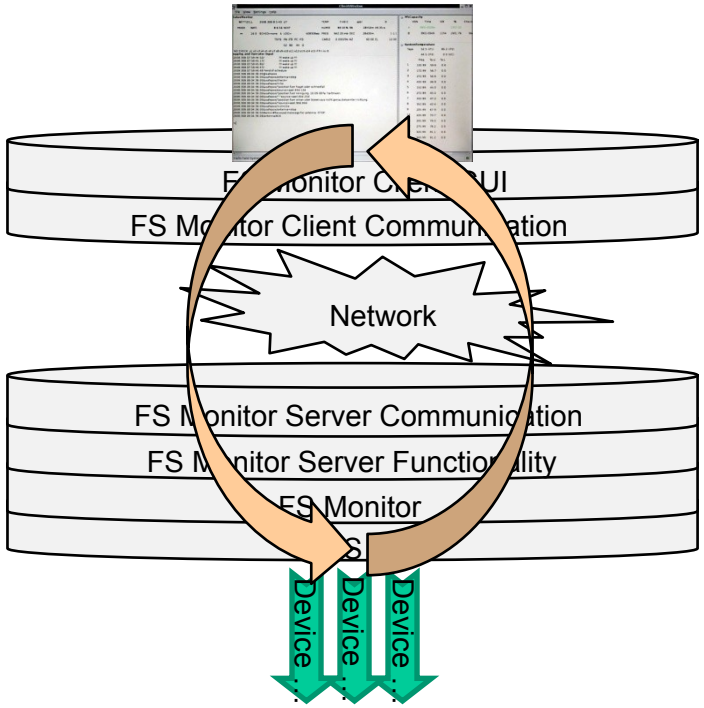
A fieldsystem client – graphical, textual or browser based

- Separation of control and presentation logic
- Interchangeability of presentation layer (console shell (ncurses), graphical user interface (wxWidgets), web access via Browser, web service, …)
- Remote controllable via client-server-architecture on idl2rpc-middle-ware
- Modularity in window units and additionaly possible, separately created administration user interfaces for each device
- Basis for graphical user interface: wxWidgets (C++ based Open-Source-Framework for plattform indefendent developement of graphical user interfaces)

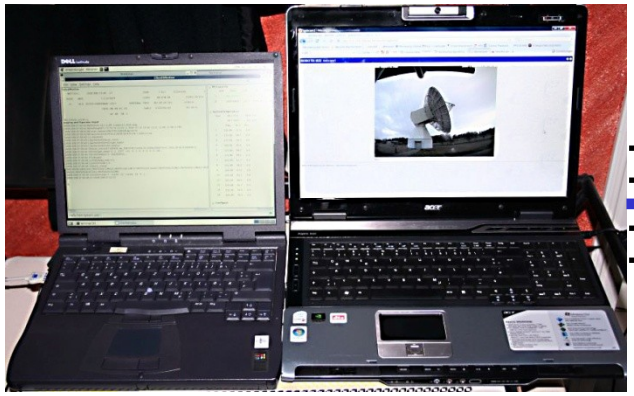


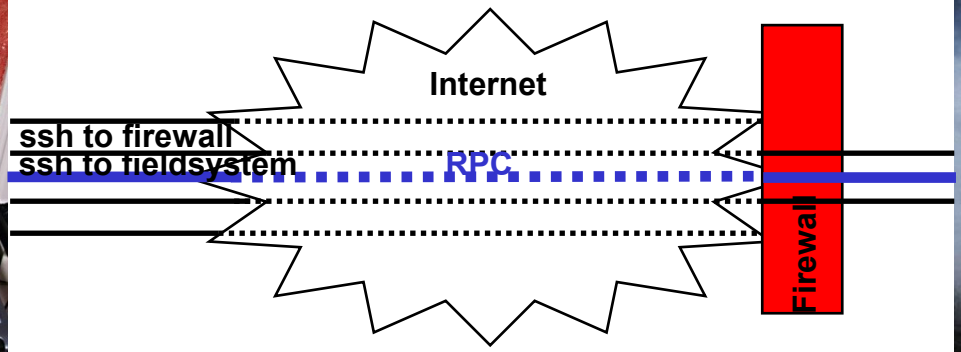
Webcam

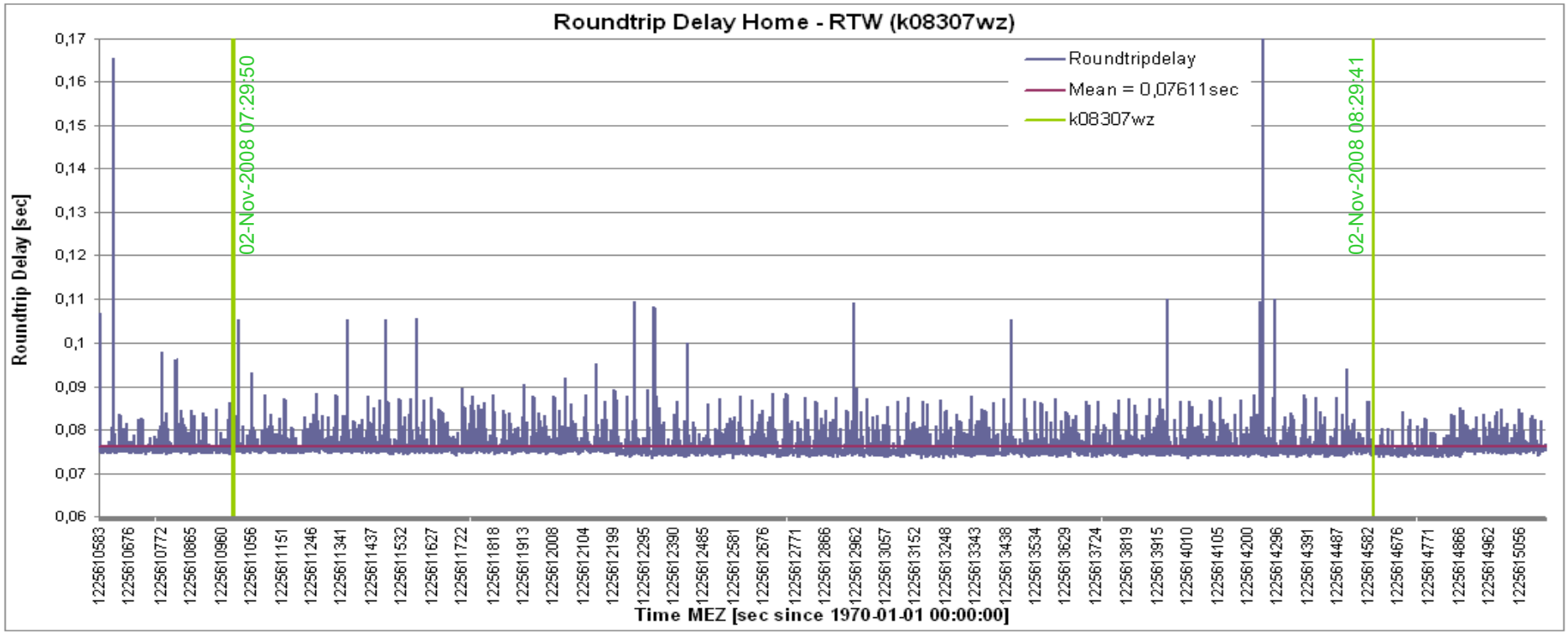
The first tests – Wettzell, O'Higgins and TIGO go remote



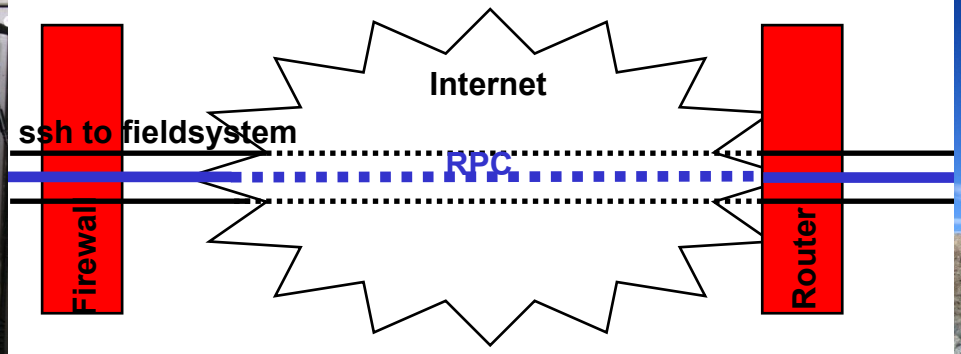
The first tests – Radiotelescope Wettzell (RTW)/Germany

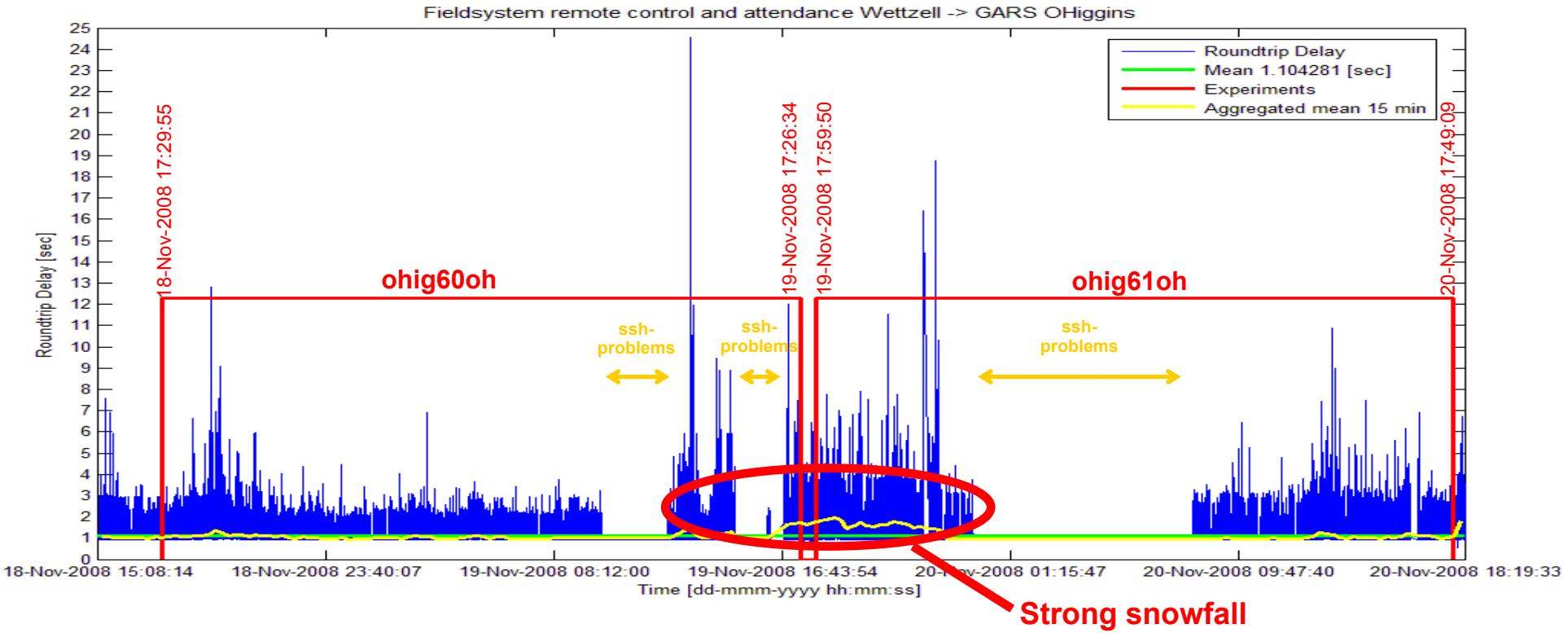




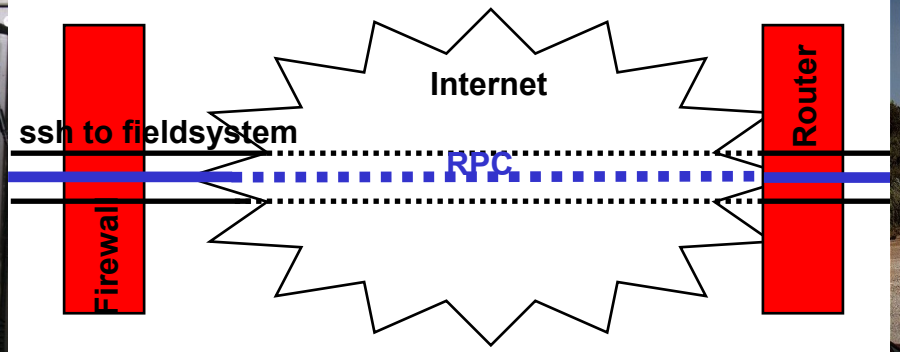


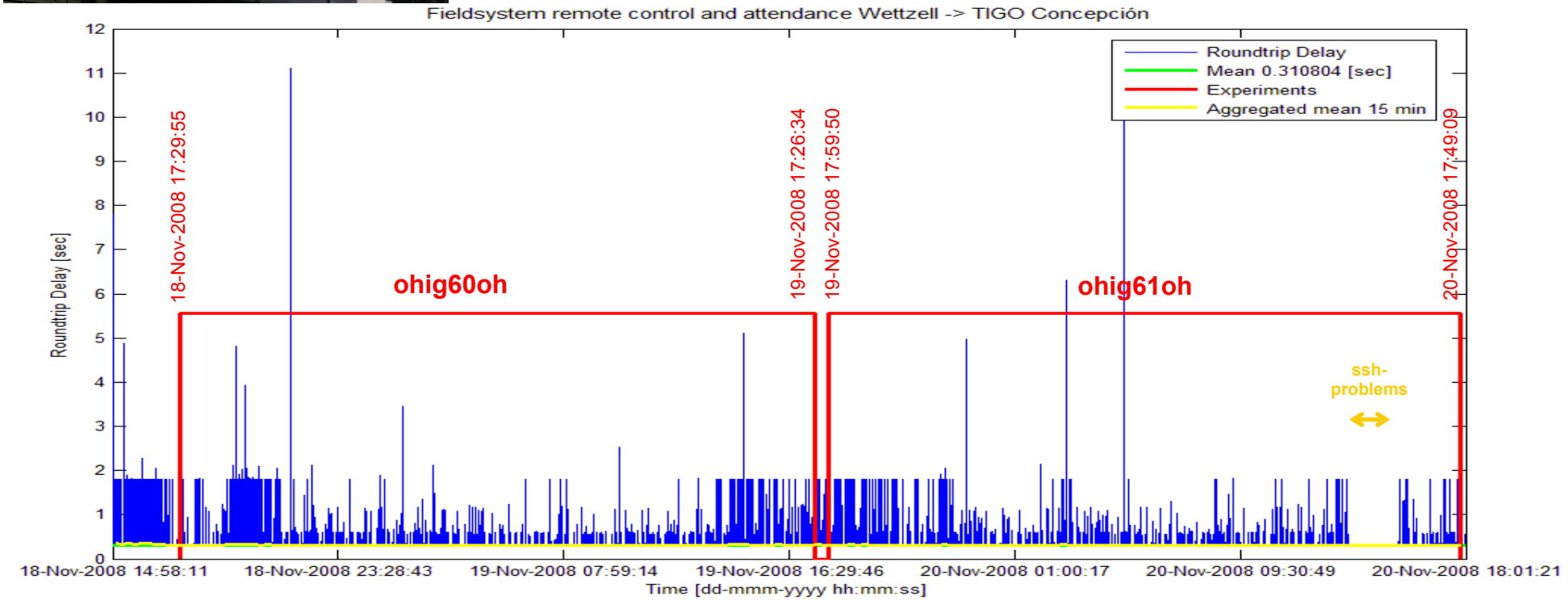
The first tests – GARS O'Higgins/Antarctica



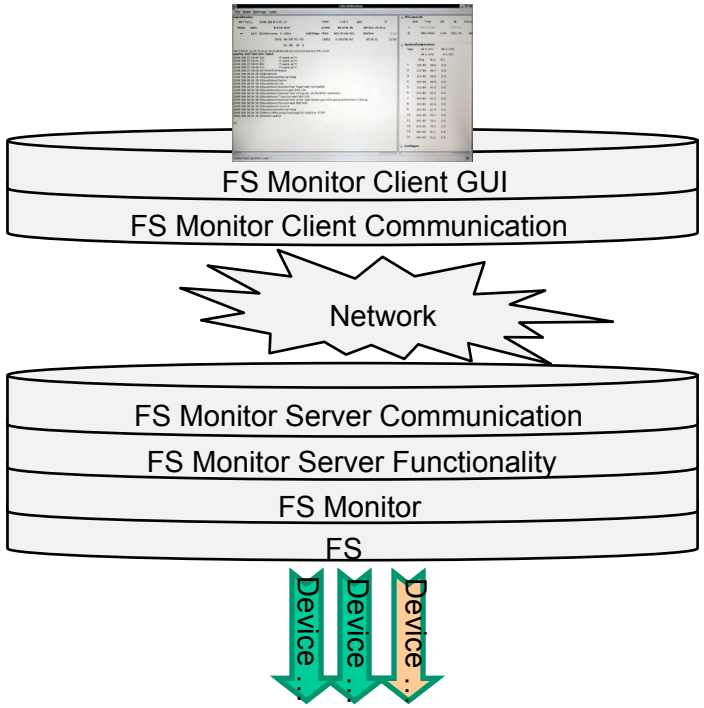


The first tests – TIGO Concepción/Chile





Adding new devices to the fieldsystem



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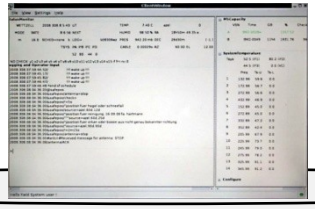


FS Monitor Client GUI

FS Monitor Client Communication

Network

FS Monitor Server Communication

FS Monitor Server Functionality

FS Monitor

FS

Device ...

Device ...

DBBC Client GUI

DBBC Client Communication

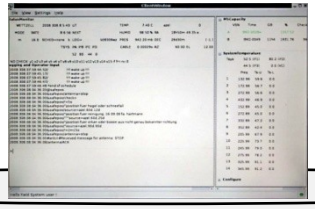
Network

DBBC Server Communication

DBBC Server Functionality

DBBC Hardware

Adding new devices to the fieldsystem



FS Monitor Client GUI

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DBBC Client Com.

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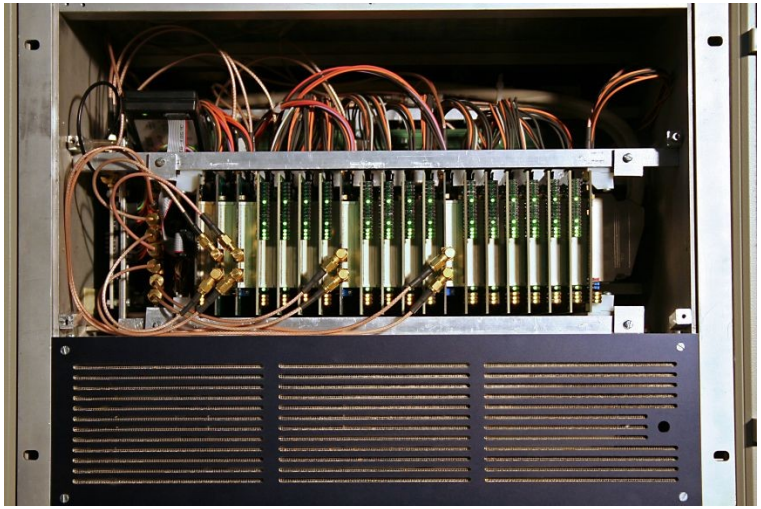
DBBC Hardware

Adding new devices to the fieldsystem

e.g. DBBC

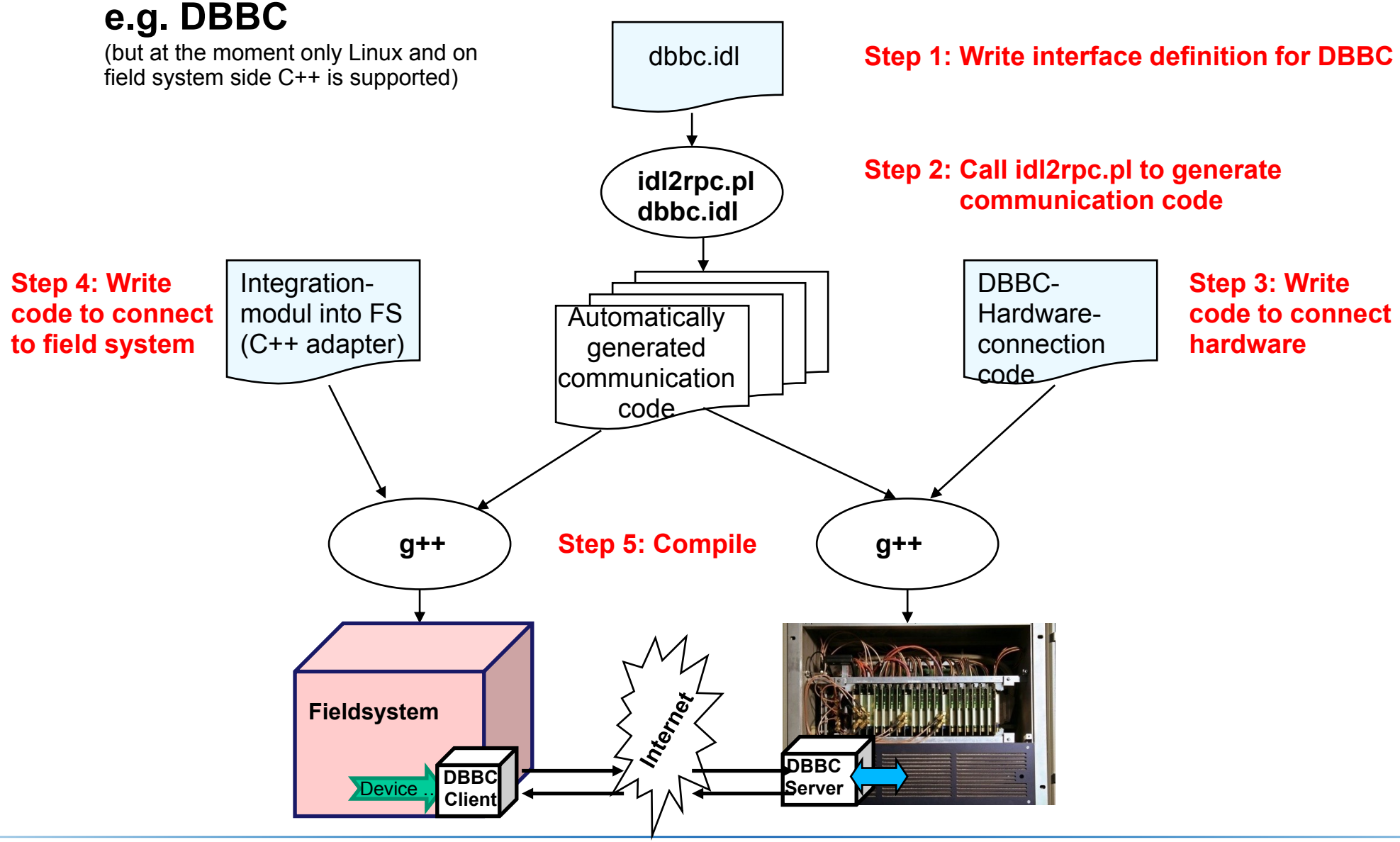


DBBC (INAF)

A fieldsystem extension – remote controlled, autonomous devices

e.g. DBBC

(but at the moment only Linux and on field system side C++ is supported)



Parallel FS integration in classical style

e.g. DBBC (Reinhard Zeitlhöfler)

Abstract

- A command set for the DBBC controlling is defined in the IRA-INAF Technical Report DBBC Management Command Set.
- This command set is implemented as Field System Snap Commands in the station programs (user2/st) at Wettzell.
- First experiences with connections from Field System to DBBC for tests and developing.

DBBC Command Implementation in the Field System Software

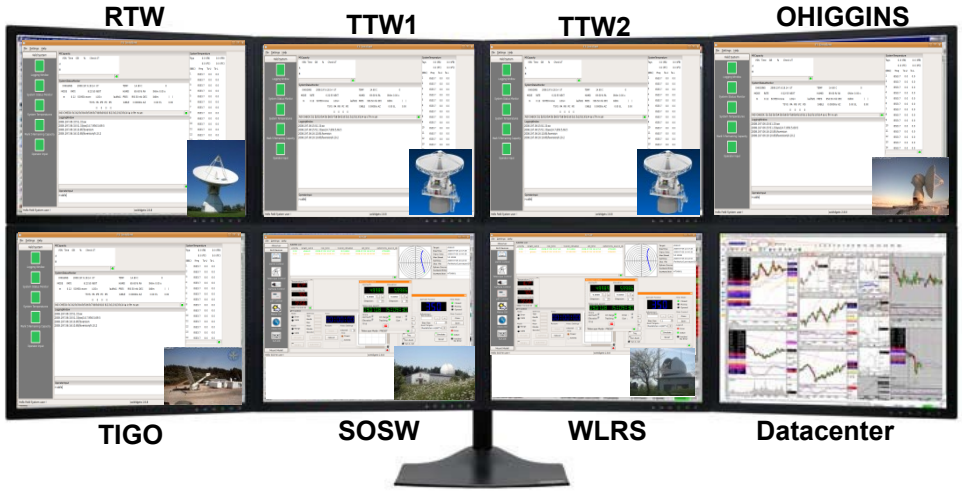
- According to the description commands are defined in the control file user2/stcmd.ctl to be known to the Field System as Snap Commands.
- The program user2/stqkr/stqkr.c calls the corresponding functions for parsing, and if inputs are accepted, for sending to the server (DBBC) using TCP,IP protocol over standard text sockets.
- At the moment the server is just a simulation program running also on FS-PC.
- Suggestions are made to change parts of the DBBC command implementation and to think about ASCII data handshake replys

A future concept – Combined control of different systems in a geodetic observatory

Combining ideas

e.g. combined control of different systems in a geodetic observatory

- Think about optimizing work flows
- Increasing the number of observations with e-control (automation and remote attendance/control
- Time sharing of measuring equipment
- Just-on-time scheduling and updating to adapt flexible observation programs
- Additional integrated safdety system(s)
- Standardization of system software
- BUT: There will be allways situations where highly educated personnel must be at the observatories



Think about the technical realisations of GGOS ?

Picture similar to: Hase, Hayo; et. al.: Twin Telescope Wettzell (TTW) - a VLBI2010 Radio Telescope Project. IVS General Meeting 2008

Thank you!

And this is a lucky remote observer in his private “home observatory” controlling the radiotelescope Wettzell immediatly after waking up!